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ABSTRACT

This chapter summarizes what the best available nationally representative data reveal about the rates of, and reasons for, the turnover of math and science teachers. The results show that contrary to conventional wisdom, the problems schools have adequately staffing classrooms with qualified teachers are not due to increases in student enrollment or increases in teacher retirement. Rather, large numbers of teachers leave teaching for other reasons, such as job dissatisfaction and in order to pursue other careers. These findings suggest that educational policy initiatives will not solve school staffing problems if they do not address the problem of teacher retention. (Contains 12 references.) (Author/NB)

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Turnover and Shortages among Science and Mathematics Teachers in the United States

Richard M. Ingersoll

Richard M. Ingersoll, a former high school teacher, is currently an associate professor of education and sociology at the University of Pennsylvania. Dr. Ingersoll's research looks at elementary and secondary schools as workplaces, teachers as employees, and teaching as a job. He is a nationally recognized expert on the problem of out-of-field teaching and has published numerous articles on the problems of teacher turnover and teacher shortages. He is also the author of *Who Controls Teachers Work? Power and Accountability in America's Schools* (Harvard University Press 2002), which examines the degree to which schools are centralized or decentralized and its impact on school performance.

Few educational problems have received more attention in recent times than the failure to ensure that elementary and secondary classrooms are all staffed with qualified teachers. In the mid-1980s, a series of highly publicized reports began to focus national attention on the coming possibility of severe teacher shortages in elementary and secondary schools (e.g., National Commission on Excellence in Education 1983; National Academy of Sciences 1987). These reports predicted a dramatic increase in the demand for new teachers, primarily because of two converging demographic trends: increasing student enrollments and increasing teacher turnover due to a graying teaching force. Subsequent shortfalls of teachers would, in turn, force many school systems to resort to lowering standards to fill teaching openings, the net effect of which would inevitably be high numbers of underqualified teachers and lower school performance. More recent reports stressed that shortages would affect some teaching fields more than others. Special education, math, and science, in particular, have been identified as fields with especially high turnover and therefore most likely to suffer shortages (Murnane et al. 1991; Boe, Bobbitt, and Cook 1997; Grissmer and Kirby 1992).

As a result, over the past decade, the inability of schools to adequately staff classrooms with qualified teachers has increasingly been recognized as a major social

This chapter draws from an earlier paper prepared in February 2000 for the National Commission on Mathematics and Science Teaching for the 21st Century, chaired by John Glenn.

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problem, has received widespread coverage in the national media, and has been the target of a growing number of reform and policy initiatives (National Commission on Teaching and America's Future 1997). The dominant policy response to school staffing problems has been to attempt to increase the supply of available teachers through a wide range of recruitment initiatives. Some programs, such as Troops-to-Teachers, are designed to entice professionals into mid-career changes to teaching. Others, such as Teach for America, seek to lure the "best and brightest" college graduates into teaching. A wide range of alternative licensing programs are designed to ease entry into teaching. Finally, financial incentives, such as signing bonuses, the forgiving of student loans, housing assistance, and tuition reimbursement have all been instituted to aid recruitment.

Concern over school staffing problems has also given impetus to research on teacher shortages and turnover. However, as numerous analysts have noted, it was difficult, initially, to study these issues because of a lack of accurate data, especially at a nationally representative level, on many of the pertinent issues surrounding teacher supply, demand, and quality. To obtain such data, the National Center for Education Statistics (NCES), the statistical arm of the U.S. Department of Education, designed the Schools and Staffing Survey (SASS) in the late 1980s. This is now the largest and most comprehensive data source available on the staffing, occupational, and organizational aspects of schools. SASS administers survey questionnaires to a random sample of about 55,000 teachers from all types of schools and from all 50 states. In addition, all those teachers who left their teaching jobs in the year subsequent to the administration of the initial survey questionnaire are again contacted to obtain information on their departures. This supplemental study, known as the Teacher Follow-up Survey (TFS) (National Center for Education Statistics 1995), is the largest and most comprehensive data source on teacher turnover in the United States. NCES has administered SASS/TFS on a regular basis; to date, four cycles have been released: 1987–89; 1990–92; 1993–95; and 1999–2001. [The last cycle was not fully released when this chapter was written.]

The Research Project

Over the past decade, I have conducted research, using SASS and TFS, to study a number of issues concerned with teacher turnover, shortages, and quality. This chapter draws from this larger body of research to briefly summarize what the data reveal about the rates of and reasons for teacher turnover. (For more detailed presentations of this research, see Ingersoll 1999, 2001a, 2001b, 2002.)

The data presented here come primarily from the 1995 TFS and represent all teachers for grades K–12 and from both public and private schools. Math and science teachers are the primary focus of this chapter. The latter are those identified by their principals as having their main teaching assignment in either math or science and represent about 11 percent of the total teaching force. About 22 percent of these math/science teachers are employed in elementary or middle schools, another 73

percent are in secondary schools, and about 5 percent are in combined (K–12) schools. Throughout the chapter, I compare the data on math/science teachers with the data for all teachers. To provide a benchmark for both, teachers' rates of turnover are compared to levels of employee turnover in other occupations.

There are two types of teacher turnover. The first, often called *teacher attrition,* refers to those who leave the occupation of teaching altogether. The second type, often called *teacher migration,* refers to those who transfer or move to different teaching jobs in other schools. Research on teacher supply and demand has often emphasized the first type and neglected the second type. Many people assume that teacher migration is a less significant form of turnover because it does not increase or decrease the overall supply of teachers, as do retirements and career changes, and, hence, that it does not contribute to the problem of staffing schools and shortages. From a systemic point of view, this is probably correct. However, from the viewpoint of those managing schools, teacher migration and attrition have the same effect; in either case it results in a decrease in staff members, who usually must be replaced. Hence, from the schools' perspective, teacher migration can, indeed, contribute to the problem of keeping schools staffed with qualified teachers. For this reason, this chapter will present data on both teacher migration and teacher attrition. Hereafter, I refer to teacher migration as "movers," teacher attrition as "leavers," and total turnover as "departures."

After establishing how many teachers depart from their teaching jobs and how these rates compare with other occupations, this chapter presents statistics on the reasons why teachers move from or leave their teaching jobs. These data are drawn from items in the TFS questionnaire that ask teachers to indicate the reasons (up to three) for their departures, from a list provided in the questionnaire (see Appendix). Data are presented from an additional set of items that asks teachers to indicate the sources (up to three) of their dissatisfaction, if they had indicated dissatisfaction either with teaching, their school, or their salary as a reason for their turnover.

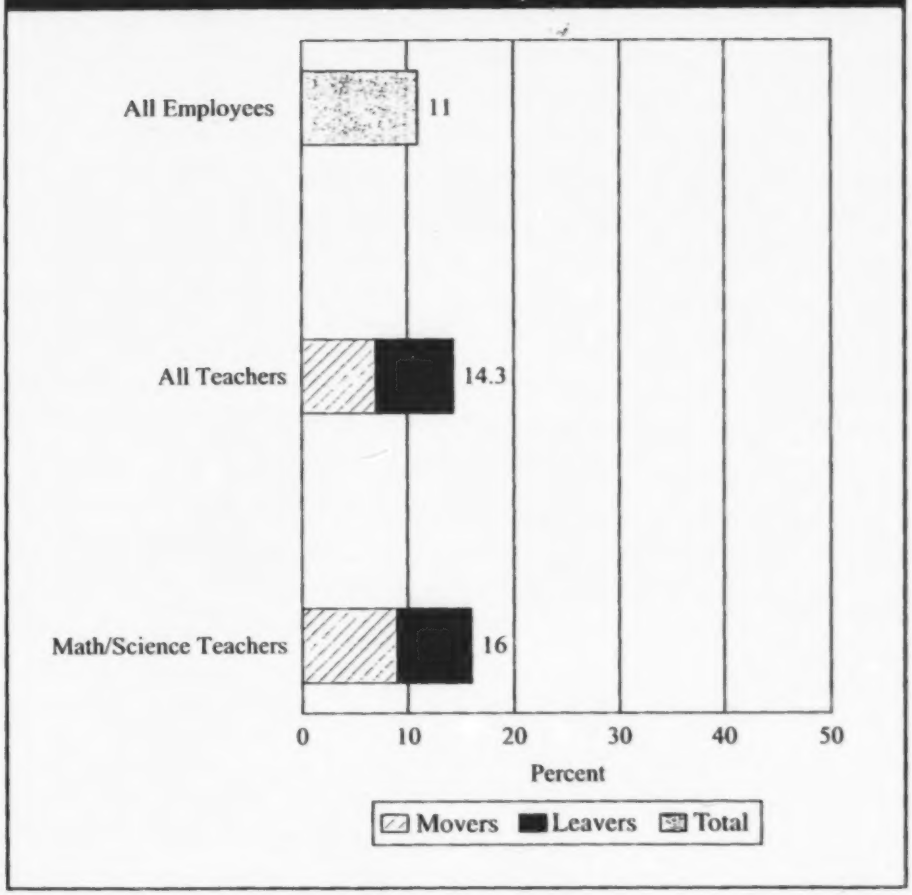
Results

Levels of Turnover

Teaching is a relatively large occupation; it represents 4 percent of the entire nationwide civilian work force. There are, for example, over twice as many K–12 teachers as registered nurses and five times as many teachers as either lawyers or professors. Moreover, the rate of turnover for teachers appears to be higher than in many other occupations. One of the best known sources of national data on rates of employee turnover, the Bureau of National Affairs, has shown that nationwide levels of employee turnover, gathered from a wide range of occupations, have been quite stable over the past decade, averaging 11 percent per year (Bureau of National Affairs 1998). The employee turnover rate provides an overall benchmark; comparison of the TFS data with the rate for employees in general suggests that teaching has a relatively high turnover rate: 14.5 percent in 1988–89; 13.2 percent in 1991–92;

14.3 percent in 1994–95; and 15.7 in 2000–2001. As a result, numerically, teacher turnover is a large phenomenon; the data show that in 1994–95 over 417,000 teachers, from a force of about 3 million, departed their teaching jobs. Total teacher turnover is about evenly split between migration and attrition; 7 percent of teacher turnovers were movers (migration) and 7.3 percent left the profession altogether (attrition). Interestingly, the turnover rate for math/science teachers—16 percent—is not much higher than for other teachers, and the difference is not statistically significant (see Figure 1).

Figure 1. Percent Annual Employee Turnover, and Percent Annual Teacher Turnover



Note: Employee data from Bureau of National Affairs. 1998. BNA's quarterly report on job absence and turnover. *Bulletin to Management.* Washington, DC: Bureau of National Affairs.

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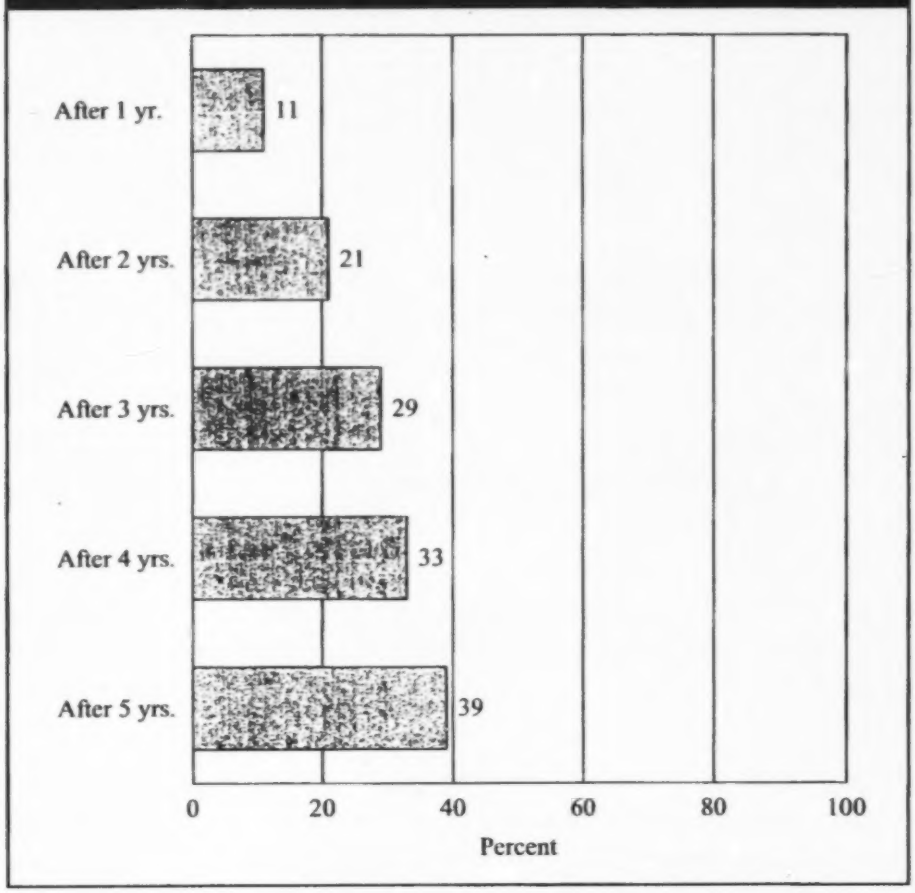
Turnover, however, is not equally spread across the teaching force. Teachers' decisions about whether to stay or leave are influenced, in particular, by the length of their teaching experience. Beginning teachers have very high rates of departure; these rates significantly decline through the mid-career period as teachers "settle in," and then rise again in the retirement years. This means that teaching is an occupation that loses many of its newly trained members very early in their careers.

Figure 2. Beginning Teacher Attrition (cumulative percent teachers having left teaching occupation, by years of experience)



Note: The cumulative rates of beginning teacher attrition shown in Figure 2 are only a rough approximation. The data do not follow a particular "class" or cohort of newly hired teachers to ascertain how many remain in teaching after a particular length of time. Instead, the cumulative loss of new teachers was calculated by multiplying the probabilities of turnover for successive years. These cumulative estimates do not account for those who later reenter teaching .

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Figure 2, for example, provides a rough estimate of the cumulative losses of beginning teachers from attrition in their first several years of teaching. The data suggest that after just three years, 29 percent of all beginning teachers have left teaching altogether, and after five years, fully 39 percent have left teaching. Because of sample size limitations, it is not possible to make precise estimates of the cumulative losses for math/science teachers alone; however, the data suggest they are slightly higher than the averages depicted in Figure 2.

These high turnover rates account for most of the demand for new teachers, which, in turn, is a driving force behind school staffing problems. The data show that while student enrollments are increasing, the demand for new teachers is not primarily due to these increases. In recent years, the vast majority of new hires have simply been replacements for those who have just departed. For instance, the TFS data show that about 286,200 teachers (excluding within-district transfers) were newly hired by schools just prior to the 1993–94 school year. In the following 12 months, about 213,000 teachers—a figure equivalent to 75 percent of those just hired—left the profession altogether. In short, the demand for new teachers, and the subsequent problems schools face ensuring that classrooms are staffed with qualified teachers, is to a significant extent due to teachers moving from or leaving their jobs at higher rates than in many other occupations. These patterns are chronic; similar results are found in all three cycles of the TFS data from the late 1980s to the mid-1990s and appear to be true for the 2000–2001 data (which were not fully released when this chapter was written).

Reasons for Turnover

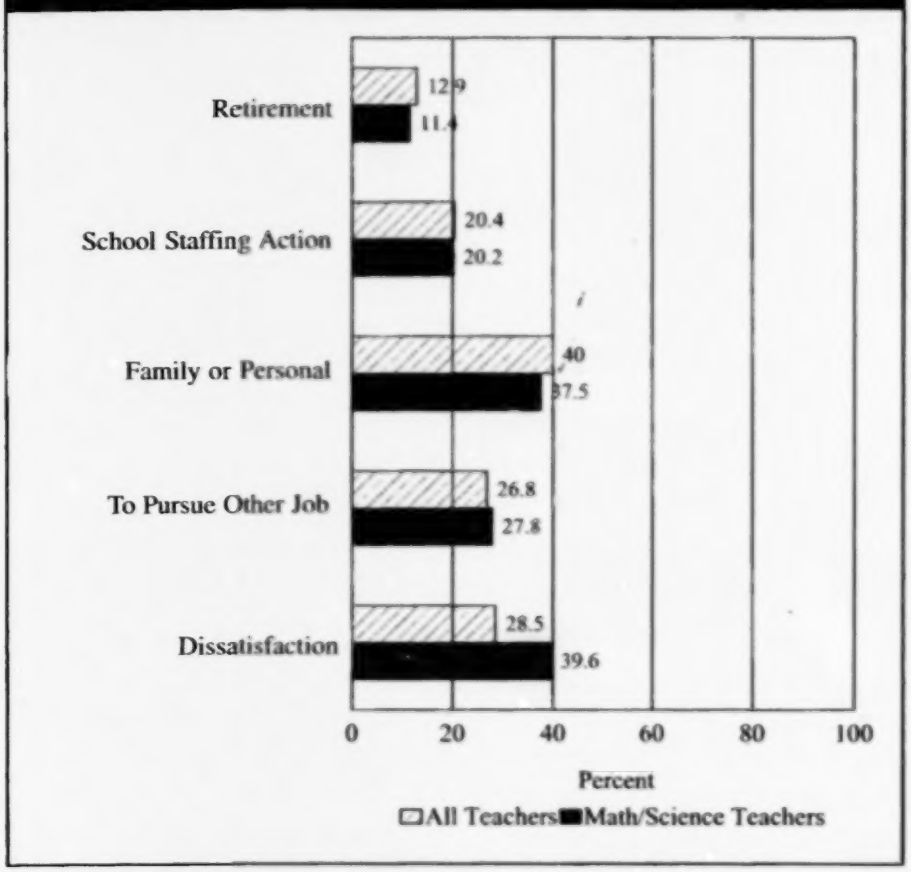
This section turns to the reasons behind these relatively high rates of teacher turnover. Table 1 lists the data on teachers' reasons for their leaving—separately for all teachers and math/science teachers and also separately for movers (migration) and leavers (attrition). Note that the column segments in Table 1, displaying percentages of teachers giving various reasons for turnover, each add up to more than 100 percent because respondents could indicate up to three reasons for their departures. The same applies to the columns displaying reasons for dissatisfaction-related turnover. The Table 1 data (but with movers and leavers combined) are also more succinctly illustrated in Figures 3 and 4.

As illustrated in Figure 3 and Table 1, overall, math/science teachers do not greatly differ from other teachers in the reasons why they depart from their teaching jobs. Contrary to conventional wisdom, retirement is not an especially prominent factor. The latter actually accounts for only a small part (13 percent) of total turnover. Of course, if one focuses on attrition alone (only those leaving teaching altogether) retirement is more prominent because, by definition, migration excludes retirement. Even in this case, however, retirement is not an especially prominent factor; retirement accounts for only a quarter of leavers (25 percent). Notably, retirement also does not account for the relatively high rates of turnover by math/science teachers.

Table 1. Percent Teacher Turnover and Percent Teachers Giving Various Reasons for Their Turnover

	All Teachers		Math/Science Teachers	
	Movers	Leavers	Movers	Leavers
Rates of Turnover	7	7.3	9	7
Reasons for Turnover				
Retirement	-	25	-	26
School Staffing Action	34	8	28	11
Family or Personal	36	44	32	45
To Pursue Other Job	29	25	33	21
Dissatisfaction	32	25	48	28
Poor salary	49	61	53	66
Poor administrative support	51	32	57	22
Student discipline problems	22	24	33	21
Lack of faculty influence and autonomy	18	15	11	15
Poor student motivation	12	18	17	32
Poor opportunity for professional advancement	8	5	4	1
Inadequate time to prepare	5	6	3	6
Intrusions on teaching time	5	11	6	12

Figure 3. Percent Teachers Giving Various Reasons for Their Turnover



School staffing cutbacks, due to layoffs, school closings, and reorganizations, account for a larger proportion of total turnover than does retirement. Staffing actions more often result in migration to other teaching jobs rather than leaving the teaching occupation altogether (34 percent of migration and 8 percent of attrition). Personal reasons, such as departures for pregnancy, child rearing, health problems, and family moves are more often given as reasons for turnover than are either retirement or staffing actions (36 percent of migration and 44 percent of attrition).

Finally, two related reasons are, collectively, a very prominent source of turnover. About half of all teachers who depart their jobs give as a reason either job dissatisfaction or the desire to pursue another job, in or out of education. Notably, math/science teachers are significantly more likely to move from or leave their teaching jobs because of job dissatisfaction than are other teachers (40 percent of math/science and 29 percent of all teachers).

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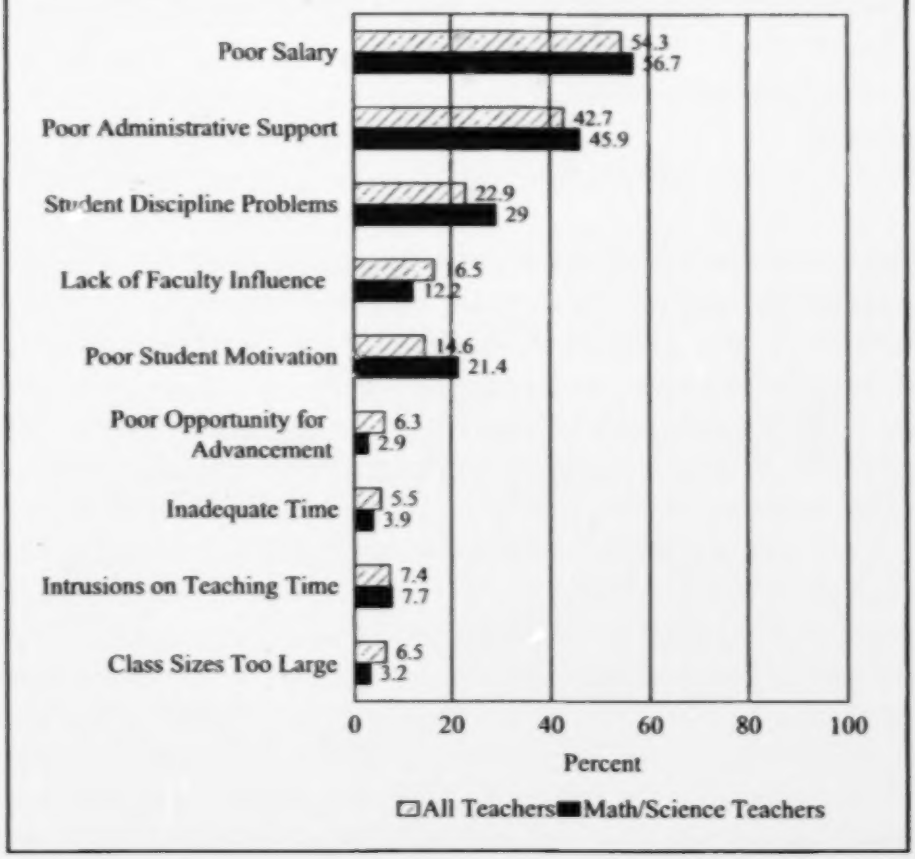
As illustrated in Figure 4 and Table 1, of those who depart because of job dissatisfaction, the most common reasons given are low salaries, a lack of support from the administration, student discipline problems, lack of student motivation, and lack of influence over school decision-making. Moreover, several factors stand out as *not* serious enough to lead to much turnover: large class sizes, intrusions on classroom time, lack of planning time, and lack of opportunity for professional advancement. These findings were found to be true across different cycles of the data and across different subsets of teacher turnover. In general, similar kinds of dissatisfactions lie behind both teacher migration and teacher attrition. Further analyses of the TFS migration data show that there is a strong flow of teachers from less desirable to more desirable schools. After controlling for the type of school, four factors stand

Figure 4. Percent Teachers Giving Various Reasons for Their Dissatisfaction-related Turnover



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out as related to both teacher migration and attrition: schools with low salaries, student discipline problems, little support for new teachers, and little faculty input into school decision-making.

In sum, the data indicate that math/science teachers, like other teachers, depart their jobs for a variety of reasons. Retirement accounts for a relatively small number of total departures; a moderate number of departures are due to school staffing actions; a large proportion indicate they depart for personal reasons; and a large proportion also report they depart either because they are dissatisfied with their jobs or in order to seek better jobs or other career opportunities.

Implications

Since the early 1980s, educational policy analysts have predicted that shortfalls of teachers resulting primarily from two converging demographic trends—increasing student enrollments and increasing teacher retirements—would lead to problems staffing schools with qualified teachers and, in turn, lower educational performance.

This analysis indicates, however, that school staffing problems for neither math/science nor other teachers are solely, or even primarily, due to teacher shortfalls caused by increases in student enrollment or increases in teacher retirement. In contrast, the data suggest that large numbers of teachers depart teaching for reasons other than retirement, including job dissatisfaction and the desire to seek better jobs or other careers.

These findings have important implications for educational policy. Supply and demand theory holds that where the quantity of teachers demanded is greater than the quantity of teachers supplied, there are two basic policy remedies: increase the quantity supplied or decrease the quantity demanded. As noted in the beginning of this chapter, teacher recruitment, an example of the former approach, has been and continues to be a dominant approach to addressing school staffing inadequacies. However, this analysis suggests that recruitment programs alone will not solve the staffing problems of schools if they do not also address the problem of teacher retention. In short, recruiting more teachers will not solve staffing inadequacies if large numbers of those teachers then prematurely leave.

What then can be done? From the perspective of this analysis, schools are not simply victims of inexorable demographic trends, and there is a significant role for the management of schools in both the genesis of, and solution to, school staffing problems. Rather than increase the quantity of teacher supply, an alternative solution to school staffing problems, documented by this analysis, is to decrease the demand for new teachers by decreasing turnover. The data suggest that the way to improve teacher retention is to improve the conditions of the teaching job. In schools across the country, significantly lower levels of teacher turnover are found where there is more support from the school administration for new teachers, such as induction and mentoring programs. The same holds for schools with higher salaries, fewer student discipline problems, and enhanced faculty input into school decision-making. In short, if we could improve these aspects of schools, the result would be lower rates of

turnover, which, in turn, would diminish school staffing problems and ultimately aid the performance of schools.

Appendix

Definitions of Measures of Reasons for Turnover

In the Teacher Follow-up Survey (TFS), teachers could list up to three choices from a list of 12 reasons for their departures. The 12 reasons are grouped into five categories, as follows:

1. Retirement
2. School Staffing Action (reduction-in-force/lay-off/school closing/reassignment)
3. Family or Personal (family or personal move; pregnancy/child rearing; health; other family or personal reasons)
4. To Pursue Other Job (to pursue another career; to take courses to improve career opportunities in or outside the field of education; for better teaching job)
5. Dissatisfaction (dissatisfied with teaching as a career; dissatisfied with the school; for better salary or benefits)

Those teachers who indicated dissatisfaction, as defined above, as a reason for their departure, could then list up to three choices from a list of 12 reasons for their dissatisfaction. I grouped the 12 reasons into nine categories, as follows:

1. Poor Salary
2. Poor Administrative Support (lack of recognition and support from administration; lack of resources and material/equipment for your classroom; inadequate support from administration)
3. Student Discipline Problems
4. Lack of Faculty Influence and Autonomy (lack of influence over school policies and practices; lack of control over own classroom)
5. Poor Student Motivation (poor student motivation to learn)
6. Poor Opportunity for Professional Advancement
7. Inadequate Time to Prepare (inadequate time to prepare lesson/teaching plans)
8. Intrusions on Teaching Time (intrusions on teaching time—that is, not enough time directly teaching students)
9. Class Sizes Too Large

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